Western Interconnection Synchrophasor Program

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Western Electricity Coordinating Council

Assuring reliability in the Western Interconnection

Key Activities

- WECC's "Western Interconnection Synchrophasor Program" is installing more than 300 phasor measurement units (PMUs) and 60 phasor data concentrators (PDCs) across the Western Interconnection.

Aims and Strategies

- Provide grid operators and reliability coordinators with more frequent and time-synchronized system information.
- Better system visibility will help system operators avoid large-scale regional outages, better utilize existing system capacity, and enable greater utilization of intermittent renewable generation resources.

Results and Benefits

- 19 organizations are participating in the project, providing 100% coverage for the Western Interconnection.
- Real-time information and automated controls being deployed will enable grid operators to allow an additional 100 MW of operational capacity on the California-Oregon Intertie (COI). Similar system benefits are possible in other parts of the system.

Transmission System Modernization

Phasor Measurement Unit

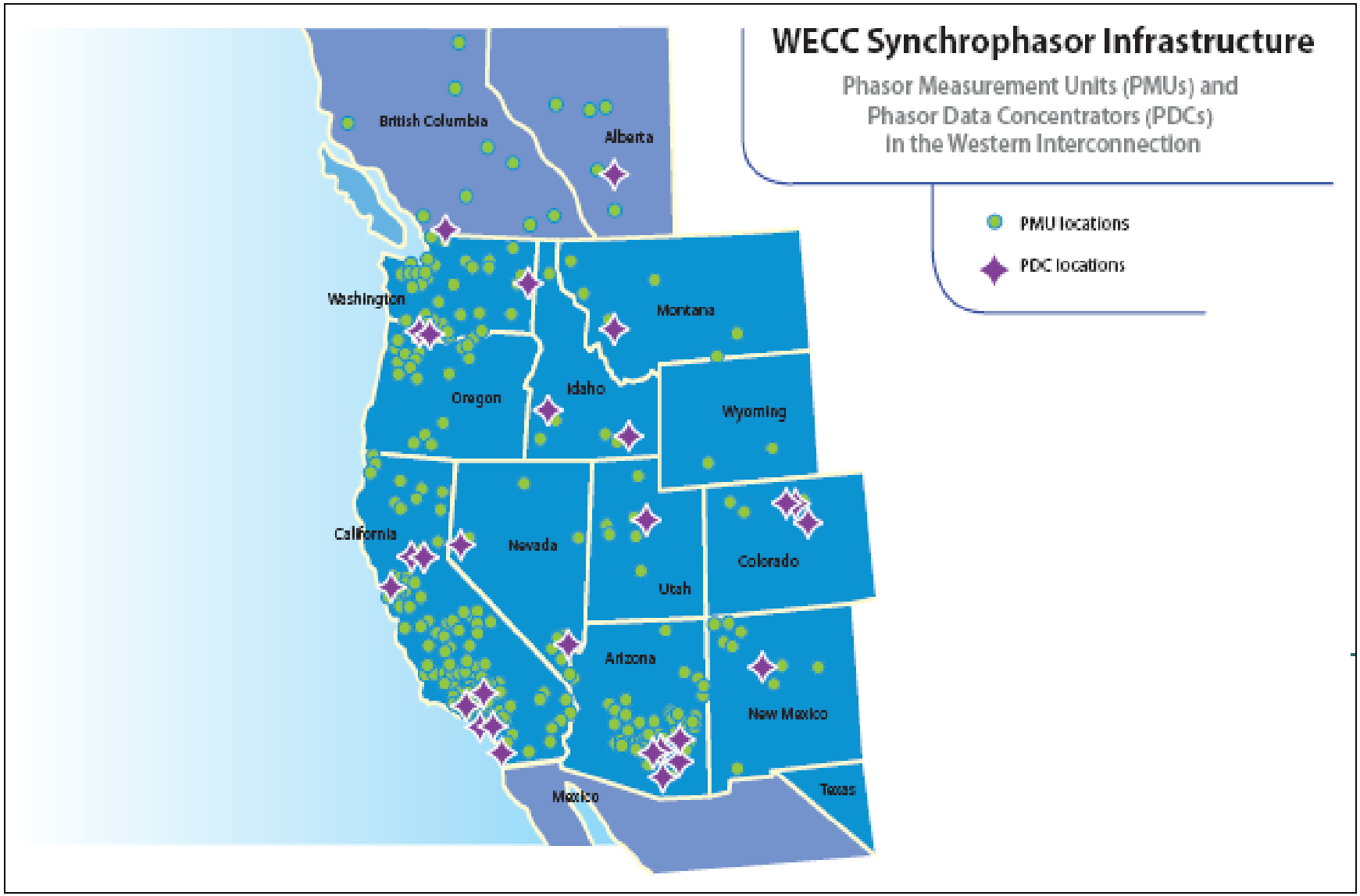
Facts & Figures

Total Project Budget:
$107,780,000

Federal Share:
$53,890,000

Project Area:
Western Interconnection,
1.8 million square miles

Project Team:
19 utility organizations


WECC Synchrophasor Infrastructure
Phasor Measurement Units (PMUs) and
Phasor Data Concentrators (PDCs)
In the Western Interconnection
PMU locations
PDC locations
British Columbia
Alberta
Washington
Montana
Oregon
Idaho
Wyoming
California
Nevada
Utah
Colorado
Arizona
New Mexico
Mexico
Texas

DOE's Grid Modernization Efforts

- From Secretary Chu's June13, 2011 Grid Modernization speech:

  "…The Western Interconnection Synchrophasor Program (WISP), led by the Western Electricity Coordinating Council (WECC) along with 18 additional participants, is an effort to **modernize the operation of the Western transmission system, increasing reliability and system performance, and enabling greater use of renewable resources** such as solar, hydro, and wind.

Continued ….

DOE's Grid Modernization Efforts

- Secretary Chu's speech … continued

  …Real-time information and automated controls available from synchrophasor technology will permit grid operators to **raise operating limits** on the California-Oregon Intertie and allow up to an additional 100 MW of operational capability, equivalent to providing enough power to supply over 100,000 homes. The **advanced capability of synchrophasor technology will be used to support numerous solutions** like this throughout the US, which would not have occurred for many years without funding from the Recovery Act."

Why WISP is Significant

1. Interconnection-wide in scope;
2. The largest of the Smart Grid Investment Grant projects in the Electric Transmission Category;
3. Public, private, and international participating entities;

Why WISP is Significant

4. Deploys automatic detection and visualization of power system oscillations (a particular vulnerability in the West) and will provide decision support for mitigation;
5. Deploys automatic regional control schemes based on synchrophasor data; and
6. Demonstrates NASPInet.

WISP Synchrophasor Applications

Real Time

Oscillation Monitoring

- Mode Meter
- Spectral Estimation
- Ringdown Analysis

Oscillation Mitigation

- Decision Support

Voltage Stability
Reactive Reserve
Phase Angle
Frequency
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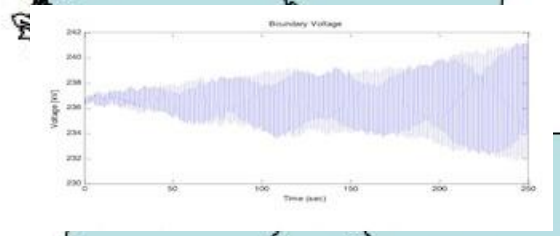
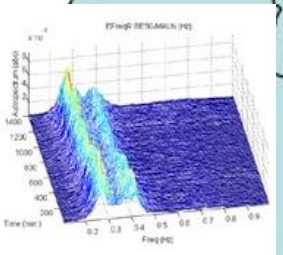
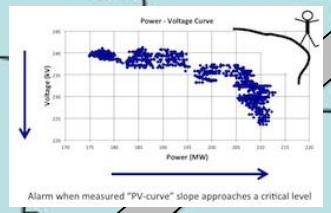
*** Monitoring & Alarming**

Visualization

Multi-Layer Data Dashboard
Playback/Animation Capture
Wide-Area View & Manipulation
Intelligent Alarm Processing







Off-Line

- **Model Validation/ Improvement**
- **Disturbance Evaluation**
- **Planning Studies**
- **Operational Studies**
- **Network Performance Baselining**

RC
Vancouver, Wash.

RC
Loveland, Colo.

Historical Archives

- **Storage**
- **Data Mining Tools**
- **Reports**

PMU Data → **PDCs** → **RC PDCs**

WECC

WISP's Support of Model Validation

- Synchrophasor data archive
  - Short term full fidelity
  - Long term events
  - Data is accessible by all participants through secure web service
- Archive data
  - Post event analysis
  - Model validation